UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/671,146	09/24/2003	David Thomas Ryan	134631	4556

7590 03/14/2005

General Electric Company
CRD Patent Docket Rm 4A59
P.O. Box 8, Bldg. K-1
Schenectady, NY 12301

EXAMINER	
FETZNER, TIFFANY A	
ART UNIT	PAPER NUMBER
2859	

DATE MAILED: 03/14/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/671,146	RYAN ET AL.	
	Examiner	Art Unit	
	Tiffany A. Fetzner	2859	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *24 September 2003*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-44* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-44* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *24 September 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED Final ACTION

Information Disclosure Statement

1. The information disclosure statement (IDS) submitted on 09/24/2003 is in compliance with the provisions of 37 CFR 1.97. Accordingly, the examiner has considered the information disclosure statement.

Drawings

2. The examiner and the official draftsperson have approved the drawing submitted September 24th 2003.

Specification

3. The disclosure is objected to because of the following informalities:

A) On **page 1** in **line 5** of paragraph **[0004]** after "failure: **insert** "of". Appropriate correction is required.

Response to Arguments

4. Applicant's arguments filed December 27th 2004 have been fully considered but they are not persuasive. Applicant argues on pages 2 and 3 of the December 27th 2004 response that the **Laskaris** US patent **4,924,198** and **Laskaris et al.**, US patent **5,278,502** fails to teach or suggest and structural component which meets applicant's thermal reservoir limitation. The examiner disagrees because although the exact term 'thermal reservoir" is lacked by the **Laskaris** reference, the "heat conductive means" of the **Laskaris** reference, (i.e. the ceramic leads metallized with silver epoxy of the **Laskaris '198** reference which is in thermal contact with the "another stage of the cryocooler and the superconductive magnet wire components of the reference) satisfies the requirements for the "thermal reservoir" component based on applicant's definition of what the "thermal reservoir" actually is according to applicant's specification. [See page 2 paragraph [0007] lines 3-7 of the applicant's original written disclosure where applicant states that "a high Tc superconducting magnet is thermally connected to a thermal reservoir, the thermal reservoir comprises a 'material' having a heat capacity of at least about 0.065 J/gK at 25K, wherein an imaging volume is formed inside the superconducting magnet assembly and a cryocooler thermally connected to the thermal reservoir."] The examiner notes that the ceramic leads metallized with silver epoxy of

the **Laskaris '198** reference in col. 14 line 59 through col. 16 line 31, comprise the material that constitutes the "thermal reservoir of the **Laskaris '198** reference. [See also the **Laskaris '198** abstract, col. 2 lines 19-27, and col. 2 lines 34-40]

5. Because the **Laskaris '198** reference does teach a structural component which is functionally a "thermal reservoir" material, which satisfies applicant's original definition of the "thermal reservoir material" the applicant's arguments of the January 12th 205 response are not persuasive. Specifically, the **Laskaris '198** reference teaches in the abstract a "Heat conductive means having a thermal conductivity greater than the resin, (i.e. the resin impregnated superconducting magnet wire) contact the impregnated coil along the length of at least one of the impregnated coil surfaces. ... with another stage" (i.e. of the multiple stage cryocooler) ... thermally coupled to the heat conductive means, so that the superconductive operation in a vacuum can occur without the coil being immersed in cryogen liquid or vapor." Therefore the "heat conductive means" of **Laskaris '198, which is in thermal contact with the superconductive magnet via the thermal coupling,** is functionally and broadly interpreted by the examiner as a "thermal reservoir". [See **Laskaris '198** abstract, col. 2 lines 19-27, col. 2 lines 34-40]

6. The examiner notes that if applicant's "thermal reservoir" as argued was intended to represent a surrounding structural volume, or something structurally other than a 'material' which satisfies the "thermal reservoir" definition of the original specification, that applicant's independent claims would need to be amended to clarify the thermal reservoir's actual structure within the claims. The examiner notes that based on the original specification definition the **Laskaris '198** reference is still applicable against the currently pending claims, because the difference between applicant's "thermal reservoir material" and the thermal ceramic metallized epoxy leads of **Laskaris '198** which maintain the connections and qualities of the applicant's "thermal reservoir material" is unclear / not claimed.

7. If applicant has any further questions concerning the examiner's position, applicant may request a telephonic interview with the examiner, since clarification of applicant's inventive structure, without raising the issue of new matter is needed

Claim Rejections - 35 USC § 103

8. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

9. The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

10. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

11. **Claims 1-29, 35-37,** and **41-42** rejected under **35 U.S.C. 103(a)** as being unpatentable over **Laskaris** US patent **4,924,198** issued May 8th 1990**,** in view of the definitive explanation of the intrinsic properties of the suitable materials, recited in **applicant's page 4 paragraph [0016]** and **the table of page 5** in applicant's original description, (i.e. in view of the fact that the suitable materials of paragraph [0016] on page 4 innately / automatically posses the known properties summarized by applicant's table on page 5.) are **maintained** and **made final**.

12. With respect to **Claim 1**, **Laskaris** teaches and shows "A cryogen free superconducting magnet assembly" [See abstract; col. 2 lines 19-39] "comprising: a

high Tc superconducting magnet;" [See the niobium tin (Nb_3Sn) high temperature superconductor magnets of col. 3 lines 51-64] "and a thermal reservoir" (i.e. the heat conductive means) [See the abstract, col. 14 line 14 through col. 16 line 31; where a ceramic lead is used in a lead section as the heat conductive means to conduct heat from 50 degrees K to 10 degrees K with the leads metallized with silver epoxy. See also col. 2 lines 19-39] **Laskaris** teaches and shows that the heat conductive means is "in thermal contact with the high Tc super conducting magnet", [See col. 2 lines 19-39, abstract].

13. **Laskaris** lacks directly teaching the limitation "wherein the thermal reservoir comprises a material having a heat capacity (I.e. the materials specific heat) "of at least about 0.065 J/gK at 25 K". However, **Laskaris** teaches a temperature of 9K, 10K and the range from 10K upto 50K, [See col. 8 lines 30-38; col. 9 line 63 through col. 10 line 4; col. 11 lines 3-12; col. 12 lines 27-29; col. 14 line 23 through col. 15 line 67; col. 3 lines 62-66]. Additionally, the material, which comprises the thermal reservoir of Laskaris, is epoxy (i.e. col. 15 lines 22-41), or ceramic [See col. 14 line 59 through col. 15 line 68] these teachings are suggestive of applicant's claimed feature however, because applicant teaches on page 4 of the original specification that "Araldite" $_{TM}$ materials comprise epoxy, methacrylate, and polyurethane; and that "Glyptal" $_{TM}$ is a resin based plastic. [See applicant's specification page 4 paragraph [0016]]. Therefore, the **Laskaris** reference teaches using a thermal reservoir material which falls into the "Araldite" $_{TM}$ and "Glyptal" $_{TM}$ categories disclosed by applicant. The examiner also notes that because applicant's table on page 5 of the disclosure shows a specific heat capacity for "Araldite" $_{TM}$ of 0.081 at 20K, and 0.135 at 30k, and the **Laskaris** thermal reservoir covers the range of 9K through 50K, it would have been obvious to one of ordinary skill in the art at the time that the invention was made that the epoxy material of the **Laskaris** thermal reservoir intrinsically having a heat capacity of at least about 0.065 J/gK at 25 K".

14. Applicant please note that the examiner considers applicant's table on page 5 to be a listing of conventional prior art intrinsic properties of known materials, which an

individual of ordinary skill in the art would already have prior knowledge of, since material properties in a given set of conditions are fixed unless otherwise indicated.

15. With respect to **Claim 7**, **Laskaris** teaches and shows "a cryocooler" [See col. 2 lines 30-39; figure 1 component 123; col. 8 line 44 through col. 15 line 68]. The same reasons for rejection, obviousness, and motivation to combine, that apply to **claim 1,** also apply to **claim 7** and need not be reiterated.

16. With respect to **Claim 8**, **Laskaris** teaches and shows that "the cryocooler is thermally connected to the high Tc super conducting magnet. [See col. 2 lines 30-39; figure 1 component 123; col. 8 line 44 through col. 15 line 68]. The same reasons for rejection, obviousness, and motivation to combine, that apply to **claims 1, 7** also apply to **claim 8** and need not be reiterated.

17. With respect to **Claim 20**, **Laskaris** teaches and shows "A method of cooling a cryogen free super conducting magnet assembly comprising: providing a high Tc super conducting magnet thermally connected to a thermal reservoir, the thermal reservoir comprising a material having a heat capacity of at least about 0.065 J/gK at 25 K; and providing a cryocooler thermally connected to the high Tc super conducting magnet;" for the same reasons as those already provided with respect to **claims 1, 7,** and **8** which need not be reiterated. **Laskaris** teaches and shows the limitation of "withdrawing heat from the high Tc super conducting magnet without using a cryogen." [See col. 8 line 30 through col. 16 line 31; abstract, col. 2 lines 19-39] The same reasons for rejection, obviousness, and motivation to combine, that apply to **claims 1, 7** and **8** also apply to **claim 20** and need not be reiterated.

18. With respect to **Claim 2**, and **corresponding claims 21**, and **29** which respectively depend from **claims 1, 20** and **28**, **Laskaris** teaches and shows that "the thermal reservoir substantially surrounds the high Tc superconducting magnet." [See figure 1, the abstract where the heat conductive means contacts the impregnated coil along the length of 'at least one of" the impregnated coil surfaces. (i.e. more than one impregnated surface, "substantially surrounding the coil" is suggested from the potential of contact along a plurality of multiple coil surfaces), and also col. 2 lines 19-39] The

same reasons for rejection, obviousness, and motivation to combine, that apply to **claims 1, 7, 8, 17, 20, 27, 28** also apply to **claims 2, 21, 29** and need not be reiterated.

19. With respect to **Claim 3**, **Laskaris** lacks directly teaching the limitation "wherein the thermal reservoir comprises a material having a heat capacity of at least about 0.10 J/gK at 25 K. However, Applicant's table on page 5 lists the specific heat (i.e. the heat capacity) of "Araldite" $_{TM}$ at 20K and 30K, to be 0.081 and 0.135 respectively, and because the **Laskaris** thermal reservoir material is effective in the range of 9K through 50K, and the material taught by **Laskaris** falls into the "Araldite" $_{TM}$ category disclosed by applicant, it would have been obvious to one of ordinary skill in the art at the time that the invention was made, that 25K is between 20K and 30K wherein 0.135 – 0.081 = 0.54, while the value 0. 054 / 2 = 0.027 and the value 0.081 + 0.027 = 0.108. Therefore, applicant's table directly suggests that at 25K the specific heat capacity in (J/g-K) of the material taught by **Laskaris** is implicitly 0.108 which is "at least about 0.10 J/gK at 25 K", and meets the requirements of applicant's claims. The same reasons for rejection, obviousness, and motivation to combine, that apply to **claim 1** also apply to **claim 3** and need not be reiterated.

20. With respect to **Claim 4**, and **corresponding claim 25**, which respectively depend from **claims 1,** and **20**, **Laskaris** lacks directly teaching the limitation "wherein the thermal reservoir comprises a material having a minimum enthalpy change of at least about 0.65 J/g between 20 K and 30 K". However, because applicant's table 5 shows the Enthalpy in (J/g) of "Araldite" $_{TM}$ materials to be 0.608 at 20K or 1.688 at 30K, while the Enthalpy in (J/g) of "Glyptal" $_{TM}$ materials is 0.67 at 20K or 1.3 at 25K, or 2.2 at 30K, and because **Laskaris** teaches using a thermal reservoir material, as taught in the rejection of claim 1, which falls in the "Araldite" $_{TM}$ and "Glyptal" $_{TM}$ categories disclosed by applicant, It would have been obvious to one of ordinary skill in the art at the time that the invention was made that the **Laskaris** thermal reservoir material intrinsically has "a minimum enthalpy change of at least about 0.65 J/g between 20 K and 30 K". (i.e. 1.688-0.608=1.080; or 2.20-0.67=1.53 and both of these values are at least a change of "about 0.65 J/g between 20 K and 30 K"). The same reasons for

rejection, obviousness, and motivation to combine, that apply to **claims 1, 20** also apply to **claims 4, 25** and need not be reiterated.

21. With respect to **Claim 5**, **Laskaris** lacks directly teaching the limitation "wherein the thermal reservoir comprises a material having a minimum enthalpy change of at least about 1.55 J/g between 20 K and 30 K." However, the rejections already stated concerning claims 1 and 4 apply to the rejection of claim 5, and because applicant's table shows that "Araldite" $_{TM}$ and "Glyptal" $_{TM}$ materials "have a minimum enthalpy change of at least about 1.55 J/g between 20 K and 30 K", It would have been obvious to one of ordinary skill in the art at the time that the invention was made that the thermal reservoir material taught by **Laskaris** is intrinsically made from an "Araldite" $_{TM}$ or "Glyptal" $_{TM}$ material "having a minimum enthalpy change of at least about 1.55 J/g between 20 K and 30 K". The same reasons for rejection, obviousness, and motivation to combine, that apply to **claims 1, 4** also apply to **claim 5** and need not be reiterated.

22. With respect to **Claim 6**, and **corresponding claim 26**, which respectively depend from **claims 1,** and **20**, **Laskaris** teaches and shows that " thermal reservoir material comprises ice, epoxy, methacrylate, polyurethane, synthetic rubber, natural rubber, plastic, resin, or lead." [See col. 14 line 59 through col. 15 line 58; col. 4 lines 6-8; col. 2 line 23; and col. 3 lines 66 through col. 4 line 2]. The same reasons for rejection, obviousness, and motivation to combine, that apply to **claims 1, 3, 20, 25** also apply to **claim 6, 26** and need not be reiterated.

23. With respect to **Claim 9**, **Laskaris** teaches and shows "a high thermal conductivity connector: (i.e. metallic copper conductors) "connecting the cryocooler to the high Tc superconducting magnet. [See col. 14 line 14 through col. 18 line 31; col. 2 lines 30-39; figure 1 component 123;]. The same reasons for rejection, obviousness, and motivation to combine, that apply to **claims 1, 7, 8** also apply to **claim 9** and need not be reiterated.

24. With respect to **Claim 10**, **Laskaris** teaches and shows that "the connector comprises copper." [See col. 14 line 14 through col. 18 line 31; col. 4 line 6 through col. 5 line 66] The same reasons for rejection, obviousness, and motivation to combine, that apply to **claims 1, 7, 8, 9** also apply to **claim 10** and need not be reiterated.

25. With respect to **Claim 11**, **Laskaris** lacks directly teaching, but does suggest, the limitation that "the connector comprises a heat pipe", because the copper metallic conductors direct/pipe the heat from the first stage of the cryocooler to the second stage of the cryocooler.. [[See col. 14 line 14 through col. 18 line 31.] The same reasons for rejection, obviousness, and motivation to combine, that apply to **claims 1, 7, 8, 9** also apply to **claim 11** and need not be reiterated.

26. With respect to **Claim 12**, **Laskaris** lacks directly teaching the limitation "wherein the reservoir has a thermal capacity greater than about 9×10^5 J". However, applicant's table on page 5 of the original disclosure shows that at 30K, which is the maximum temperature disclosed by applicant, an Enthalpy (i.e. J/g) of 1.688 for "Araldite" $_{TM}$ with a mass of 833Kg or 833,000 grams by conversion. Since (833,000 g)*(1.688 J/g)=1,406,104 Joules; and the **Laskaris** reservoir is made of an "Araldite" $_{TM}$ material that is functional in the range of 10K to 50K, with applicant's 30K being in the center, [See the rejections of **claims 1, 3, 4,** and **5** which also apply to **claim 12**] It would have been obvious to one of ordinary skill in the art at the time that the invention was made that the "Araldite" $_{TM}$ material reservoir of **Laskaris** "has a thermal capacity greater than about 9×10^5 J" (i.e. 900,000 Joules) because 1,406,104 Joules is > 900,000 Joules. The same reasons for rejection, obviousness, and motivation to combine, that apply to **claims 1, 3, 4,**and **5** also apply to **claim 12** and need not be reiterated.

27. With respect to **Claim 13**, **Laskaris** teaches and shows that "the critical temperature of the high Tc superconducting magnet is greater than 20 K" [See col. 8 lines 30-59; col. 10 lines 2-4; col. 11 lines 3-10; col. 12 lines 28-48; and col. 14 line 14 through col. 16 line 31; where the maximum temperature of the **Laskaris** device is 50K]. The same reasons for rejection, obviousness, and motivation to combine, that apply to **claim** also apply to **claim 13** and need not be reiterated.

28. With respect to **Claim 14**, **Laskaris** lacks directly teaching the limitation "wherein the reservoir has a thermal mass greater than about 525 kg" However, as mentioned in the rejections of **claims 1, 3, 4, 5,** and **12**, **Laskaris** teaches reservoir materials of the "Araldite" $_{TM}$ and "Glyptal" $_{TM}$ categories, which according to applicant's table on page 5 of the original disclosure have a mass of 833kg or 588kg respectively, therefore It would

have been obvious to one of ordinary skill in the art at the time that the invention was made that the **Laskaris** reference does teach a reservoir material which "has a thermal mass greater than about 525 kg". The same reasons for rejection, obviousness, and motivation to combine, that apply to **claims 1, 3, 4, 5,** and **12** also apply to **claim 14** and need not be reiterated.

29. With respect to **Claim 22**, **Laskaris** teaches and shows " maintaining a temperature of the high Tc super conducting magnet above approximately 20 K", because in the **Laskaris** reference the high Tc super conducting magnet is maintained at 50K in the first stage of the cryocooler". [See col. 8 lines 30-59; col. 10 lines 2-4; col. 11 lines 3-10; col. 12 lines 28-48; and col. 14 line 14 through col. 16 line 31; where the maximum temperature of the **Laskaris** device is 50K]. The same reasons for rejection, obviousness, and motivation to combine, that apply to **claims 1, 20,** also apply to **claim 22** and need not be reiterated.

30. With respect to **Claim 15**, and **corresponding claim 23**, which respectively depend from **claims 1, 20** and **22**, **Laskaris** lacks directly teaching the limitation "wherein the thermal reservoir has sufficient mass to provide ride-through of at least 5 hours." (i.e. **claim 15**), "maintain the high Tc super conducting magnet below critical temperature for at least 5 hours" (i.e. **claim 23**) However, the **Laskaris** thermal reservoir does not require cryogens to remain superconductive at all. [See abstract, col. 2 lines 19-39] Therefore, the length of time that the thermal reservoir of the **Laskaris** reference can provide ride-through for is unrestricted / unlimited because the diodes taught in col. 16 lines 1-31 will conduct and continue the operation of the superconductive magnet device, in situations where quenching or disconnection occurs. According to **Laskaris** the length of time is potentially thousands of years. [See col. 15 line 58 through col. 16 line 31.] The same reasons for rejection, obviousness, and motivation to combine, that apply to **claims 1, 3, 4, 5, 12, 14, 20,** and **22** also apply to **claims 15, 23** and need not be reiterated.

31. With respect to **Claim 16**, and **corresponding claim 24**, which respectively depend from **claims 1, 20, 22** and **23**, **Laskaris** lacks directly teaching the limitation "wherein the thermal reservoir has sufficient mass to provide ride-through of at least 10

hours." (i.e. **claim 16**), "maintain the high Tc super conducting magnet below critical temperature for at least 5 hours" (i.e. **claim 24**) However, the **Laskaris** thermal reservoir does not require cryogens to remain superconductive at all. [See abstract, col. 2 lines 19-39] Therefore, the length of time that the thermal reservoir of the **Laskaris** reference can provide ride-through for is unrestricted / unlimited because the diodes taught in col. 16 lines 1-31 will conduct and continue the operation of the super conductive magnet device, in situations where quenching or disconnection occurs. According to **Laskaris** the length of time is potentially thousands of years. [See col. 15 line 58 through col. 16 line 31.] The same reasons for rejection, obviousness, and motivation to combine, that apply to **claims 1, 3, 4, 5, 12, 14, 15, 20, 22,** and **23** also apply to **claims 16, 24** and need not be reiterated.

32. With respect to **Claim 17**, **Laskaris** teaches and shows "an imaging volume is formed inside the superconducting magnet assembly." [See col. 11 lines 25-45; col. 12 line 49 through col. 13 line 31.] The same reasons for rejection, obviousness, and motivation to combine, that apply to **claims 1,** also apply to **claim 17** and need not be reiterated.

33. With respect to **Claim 18**, **Laskaris** teaches and shows "A magnetic separator" [See col. 9 lines 11-44; and col. 10 lines 22-63; where the copper or aluminum rings separate the superconductive coils.] The same reasons for rejection, obviousness, and motivation to combine, that apply to **claims 1,** also apply to **claim 19** and need not be reiterated.

34. With respect to **Claim 19**, **Laskaris** teaches and shows "A superconducting motor or generator" [See col. 16 lines 1-14] The same reasons for rejection, obviousness, and motivation to combine, that apply to **claims 1,** also apply to **claim 20** and need not be reiterated.

35. With respect to **Claim 27**, **Laskaris** teaches and shows that "the cryocooler is thermally connected to the high Tc super conducting magnet. [See col. 2 lines 30-39; figure 1 component 123; col. 8 line 44 through col. 15 line 68]. The same reasons for rejection, obviousness, and motivation to combine, that apply to **claims 1, 7, 8, 20** also apply to **claim 27** and need not be reiterated.

36. With respect to **Claim 28**, this claim is just the combination of the limitations of **claims 1, 7, 8, 17**, and **27** in combination with one another, therefore **Laskaris** teaches and shows "An MRI system comprising: a cryogen free superconducting magnet assembly having a high Tc super conducting magnet, and a thermal reservoir in thermal contact with the high Tc super conducting magnet, the thermal reservoir comprising a material having a heat capacity of at least about 0.065 J/gK at 25 K, wherein an imaging volume is formed inside the super conducting magnet assembly; and a cryocooler thermally connected to the thermal reservoir",]. Therefore The same reasons for rejection, obviousness, and motivation to combine, that apply to **claims 1, 7, 8, 17, 20**, and **27.** also apply to **claim 28** and need not be reiterated.

37. With respect to **Claim 35**, **Laskaris** teaches and shows "An MRI system comprising: a first cryogen free super conducting magnet assembly" [See abstract; col. 2 lines 19-39] "having a first high Tc super conducting magnet," [See the niobium tin (Nb_3Sn) high temperature superconductor magnets of col. 3 lines 51-64; figures 21, 22, 23 components, 251, 252] "and a first thermal reservoir" (i.e. the heat conductive means) [See the abstract, col. 14 line 14 through col. 16 line 31; where a ceramic lead is used in a lead section as the heat conductive means to conduct heat from 50 degrees K to 10 degrees K with the leads metallized with silver epoxy. See also col. 2 lines 19-39] **Laskaris** teaches and shows that the heat conductive means is "in thermal contact with the first high Tc super conducting magnet", [See col. 2 lines 19-39, figures 21, 22, and 23]; "the first thermal reservoir comprising a material having a heat capacity of at least about 0.065 j/gK at 25 K;" [See the rejection of **claim 1**, in the open coil configuration of figures 21, 22, and 23 there are two coil assemblies.]

38. **Laskaris** also teaches and shows "a second cryogen free super conducting magnet assembly" [See abstract; col. 2 lines 19-39] "having a second high Tc super conducting magnet [See the niobium tin (Nb_3Sn) high temperature superconductor magnets of col. 3 lines 51-64; figures 21, 22, 23 components, 253, 254], "and a second thermal reservoir in thermal contact with the second high Tc super conducting magnet", (i.e. a second heat conductive means) [See figure 26, the abstract, col. 14 line 14 through col. 16 line 31; where an additional ceramic lead 261 is used opposite a first

lead 261 in a lead section as the heat conductive means to conduct heat from 50 degrees K to 10 degrees K with the leads metallized with silver epoxy. See also col. 2 lines 19-39] **Laskaris** teaches and shows that the heat conductive means is "the second thermal reservoir comprising a material having a heat capacity of at least about 0.065 J/gK at 25 K," because both leads are made from the same material [See the rejection of **claim 1**, additionally in the open coil configuration of figures 21, 22, and 23 there are two coil assemblies.] "wherein an imaging volume is formed between the first and second assemblies". [See the open coil configuration of figures 21, 22, and 23 where the imaging volume is formed between the two coil assemblies; col. Col. 12 line 49 through col. 13 line 32.] The same reasons for rejection, obviousness, and motivation to combine, that apply to **claim 1** also apply to **claim 35** and need not be reiterated.

39. With respect to **MRI system Claim 36**, and corresponding **MRI system Claim 42**, which respectively depend from **claims 35**, and **41**, **Laskaris** teaches and shows "at least one cryocooler thermally connected to the first thermal reservoir." [See figures 1 component 123, figures16 through 23; col. 8 line 44 through col. 16 line 31]. The same reasons for rejection, obviousness, and motivation to combine, that apply to **claims 1, 35, 41** also apply to **claims 36, 42** and need not be reiterated.

40. With respect to **Claim 37**, **Laskaris** teaches and shows "The MR1 system of claim 36, wherein the cryocooler is thermally connected to the first thermal reservoir and the second thermal reservoir." [See figures 1 component 123, figures 16 through 23, 26; col. 8 line 44 through col. 16 line 31]. The same reasons for rejection, obviousness, and motivation to combine, that apply to **claims 1, 35, 36** also apply to **claim 37** and need not be reiterated.

41. With respect to **Claim 41**, **Laskaris** teaches and shows "An MRI system comprising: a first cryogen free super conducting magnet assembly" " [See abstract; col. 2 lines 19-39] "having a first high Tc super conducting magnet," [See the niobium tin (Nb_3Sn) high temperature superconductor magnets of col. 3 lines 51-64; figures 21, 22, 23 components, 251, 252] "a second cryogen free super conducting magnet assembly" [See abstract; col. 2 lines 19-39] "having a second high Tc super conducting magnet

[See the niobium tin (Nb_3Sn) high temperature superconductor magnets of col. 3 lines 51-64; figures 21, 22, 23 components, 253, 254]; "and a thermal reservoir in thermal contact with the first and second high Tc super conducting magnets", (i.e. the heat conductive means) [See the abstract, col. 14 line 14 through col. 16 line 31; where a ceramic lead is used in a lead section as the heat conductive means to conduct heat from 50 degrees K to 10 degrees K with the leads metallized with silver epoxy. See also col. 2 lines 19-39; col. 12 line 49 through col. 16 line 31, figures 1, 21, 22, 23, 26;] **Laskaris** teaches and shows that "the thermal reservoir comprising a material having a heat capacity of at least about 0.065 J/gK at 25 K, " [See the rejection of **claim 1**, the examiner notes that in the open coil configuration of figures 21, 22, and 23 there are two coil assemblies.] "wherein an imaging volume is formed between the first and second assemblies [See the open coil configuration of figures 21, 22, and 23 where the imaging volume is formed between the two coil assemblies; col. Col. 12 line 49 through col. 13 line 32.] The same reasons for rejection, obviousness, and motivation to combine, that apply to **claim 1** also apply to **claim 41** and need not be reiterated.

42. **Claims 30-34, 38-40, 43,** and **44** rejected under **35 U.S.C. 103(a)** as being unpatentable over **Laskaris et al.,** US patent **4,924,198** issued May 8th 1990, in view of the definitive explanation of the intrinsic properties of the suitable materials, recited in **applicant's page 4 paragraph [0016]** and **the table of page 5** in applicant's original description, (i.e. in view of the fact that the suitable materials of paragraph [0016] on page 4 innately / automatically posses the known properties summarized by applicant's table on page 5); as applied to claims 1-29 above, in further view of **Laskaris et al.,** US patent **5,278,502** issued January 11th 1994**, are clarified maintained and made final.**

43. With respect to **Claim 30**, **Laskaris '198** lacks directly teaching the limitation of "gradient coils located between the cryogen free superconducting magnet assembly and the imaging volume." However, **Laskaris et al., '502** teaches this limitation. [See **Laskaris '502** abstract, col. 7 lines 5-9; col. 1 lines 19-21, figure 1; col. 4 lines 36-49; col. 6 lines 11-59] It would have been obvious to one of ordinary skill in the art at the time that the invention was made to modify the teaching of **Laskaris et al., '502** with the teaching of **Laskaris '198** because the **Laskaris et al., '502** reference explicitly

states that the **Laskaris et al., '502** magnet is modifiable to include the super conductive magnet cartridge 12, of winding 13 as taught in the **Laskaris '198** reference. [See col. 4 lines 36-49]. The same reasons for rejection, obviousness, and motivation to combine, that apply to **claims 1, 7, 8, 17, 20**, **27**, and **28,** also apply to **claim 30** and need not be reiterated.

44. With respect to **Claim 31**, **Laskaris '198** lacks directly teaching the limitation of "passive iron shield surrounding the high Tc super conducting magnet. However, **Laskaris et al., '502** teaches/shows this limitation. [See **Laskaris et al., '502** figure 2 component 28, col. 3 lines 30-39; the passive shim components of col. 6 lines 4-11, and component 98 of figure 3.] It would have been obvious to one of ordinary skill in the art at the time that the invention was made to modify the teaching of **Laskaris et al., '502** with the teaching of **Laskaris '198** because the **Laskaris et al., '502** reference explicitly states that the **Laskaris et al., '502** magnet is modifiable to include the super conductive magnet cartridge 12, of winding 13 as taught in the **Laskaris '198** reference. [See col. 4 lines 36-49]. The same reasons for rejection, obviousness, and motivation to combine, that apply to **claims 1, 7, 8, 17, 20**, **27, 28**, and **30,** also apply to **claim 31** and need not be reiterated.

45. With respect to **Claim 32**, **Laskaris '198** lacks directly teaching the limitation of "the thermal reservoir" (i.e. the current leads 147, 149 of figure 10 component 261 of figure 26, for components 12 and 13 from the **Laskaris '198** reference shown in Figure 2 of **Laskaris et al., '502**) "is located between the gradient coils" (i.e. **Laskaris et al., '502** components 8, 22) "and the passive iron shield" (i.e. of **Laskaris et al., '502** components 28, 98). However, **Laskaris et al.,'502** shows this limitation. [See **Laskaris et al.,'502** figures 2 and 3 components 28, 98, 12, 13, 8, and 22; col. 3 lines 30-39; col. 4 lines 36-49; col. 6 lines 4-11.] It would have been obvious to one of ordinary skill in the art at the time that the invention was made to modify the teaching of **Laskaris et al., '502** with the teaching of **Laskaris '198** because the **Laskaris et al., '502** reference explicitly states that the **Laskaris et al., '502** magnet is modifiable to include the super conductive magnet cartridge 12, of winding 13 which also comprises ceramic leads as taught in the **Laskaris '198** abstract, col. 2 lines 19-39, col. 14 line 59 through col. 16

line 31, [See also **Laskaris et al., '502** col. 4 lines 36-49]. The same reasons for rejection, obviousness, and motivation to combine, that apply to **claims 1, 7, 8, 17, 20, 27, 28, 30**, and **31,** also apply to **claim 32** and need not be reiterated.

46. With respect to **Claim 33**, **Laskaris '198** shows that "the thermal reservoir" (i.e. component 261 of figure 26) "is located outside the passive iron shield" because in Figure 1 component 261 is located within cryocooler component123. The same reasons for rejection, obviousness, and motivation to combine, that apply to **claims 1, 7, 8, 17, 20, 27, 28, 30**, and **31,** also apply to **claim 33** and need not be reiterated.

47. With respect to **Claim 34**, **Laskaris '198** teaches and shows that "the thermal reservoir is enclosed in a vacuum chamber." [See **Laskaris '198** figure 1 vacuum vessel 15, and coils 17 through 22; col. 4 lines 6-21; col. 10 lines 22 through col. 11 line 45, col. 14 line 14 through col. 16 line 31figures 13, 14, and 15] Additionally, **Laskaris et al., '502** shows this limitation. [See **Laskaris et al., '502** Figure 3, components 12, and 13 which are enclosed by component 4.] It would have been obvious to one of ordinary skill in the art at the time that the invention was made to modify the teaching of **Laskaris et al., '502** with the teaching of **Laskaris '198** because the **Laskaris et al., '502** reference explicitly states that the **Laskaris et al., '502** magnet is modifiable to include the super conductive magnet cartridge 12, of winding 13 as taught in the **Laskaris '198** reference. [See col. 4 lines 36-49]. The same reasons for rejection, obviousness, and motivation to combine, that apply to **claims 1, 7, 8, 17, 20, 27, 28, 30, 31**, and **32,** also apply to **claim 34** and need not be reiterated.

48. With respect to **MRI system Claim 38**, and corresponding **MRI system Claim 43**, which respectively depend from **claims 35**, and **41**, **Laskaris '198** lacks directly teaching the limitation of "gradient coils located between the first and second cryogen free superconducting magnet assemblies" of the open magnet assembly of figures 21, 22, and 23. However, **Laskaris et al., '502** teaches this limitation with respect to claim 30 above as mentioned which need not be reiterated.

49. Additionally, because **Laskaris et al., '502** teaches that the **Laskaris '198** magnet assembly is usable with the **Laskaris et al., '502** assembly, [See col. 4 lines 36-49) It would have been obvious to one of ordinary skill in the art at the time that the

invention was made to modify the teaching of **Laskaris '198** with the teaching of **Laskaris et al., '502** in order to construct an open configuration which include the **Laskaris et al., '502** gradient coils. The same reasons for rejection, obviousness, and motivation to combine, that apply to **claims 1, 7, 8, 17, 20, 27, 28, 30, 35, 36, 40, 41** also apply to **claims 38, 43** and need not be reiterated.

50. With respect to **MRI system Claim 39**, and corresponding **MRI system Claim 44**, which respectively depend from **claims 35**, and **41**, **Laskaris '198** lacks directly teaching the limitation of "a first passive iron shield surrounding the first high Tc superconducting magnet and a second passive iron shield surrounding the second high Tc superconducting magnet" for the open magnet assembly of figures 21, 22, and 23, col. 12 line 49 through col. 15 line 10. However, **Laskaris et al., '502** teaches this limitation with respect to claim 31 above as mentioned which need not be reiterated.

51. Additionally, because **Laskaris et al.,'502** teaches that the **Laskaris '198** magnet assembly is usable with the **Laskaris et al., '502** assembly, [See col. 4 lines 36-49) It would have been obvious to one of ordinary skill in the art at the time that the invention was made to modify the teaching of **Laskaris '198** with the teaching of **Laskaris et al., '502** in order to construct an open configuration which include the passive iron shields of the **Laskaris et al., '502** reference surrounding the high temperature super conducting magnets of **Laskaris '198**. The same reasons for rejection, obviousness, and motivation to combine, that apply to **claims 1, 7, 8, 17, 20, 27, 28, 30, 31, 35, 36, 38, 40, 41, 42** also apply to **claims 39, 44** and need not be reiterated.

52. With respect to **Claim 40**, **Laskaris'198** teaches and shows "the first cryogen free superconducting magnet assembly is enclosed in a first vacuum chamber and the second cryogen free super conducting magnet assembly is enclosed in a second vacuum chamber" [See col. 12 line 59 through col. 15 line 10 and the open magnet configuration of figures 21, 22, and 23.] The same reasons for rejection, obviousness, and motivation to combine, that apply to **claims 1, 35, 36, 38, 39** also apply to **claim 40** and need not be reiterated.

53. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

54. A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Prior Art of Record

55. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

A) **Laskaris et al.,** US patent 5,225,782 issued July 6th 1993.

B) **Laskaris et al.,** US patent 5,304,934 issued April 19th1994.

56. Additionally applicant should also note the other prior art references which were noted on the Notice of References cited from the last office action of September 28th 2004.

Conclusion

57. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Tiffany Fetzner whose telephone number is: (571) 272-2241. The examiner can normally be reached on Monday-Thursday from 7:00am to 4:30pm., and on alternate Friday's from 7:00am to 3:30pm.

58. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Diego Gutierrez, can be reached at (571) 272-2245. The **only official fax phone number** for the organization where this application or proceeding is assigned is **(703) 872-9306**.

Tiffany A. Fetzner

TAF
March 9, 2005

Diego Gutierrez for

Diego Gutierrez
Supervisory Patent Examiner
Technology Center 2800